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Nasalis larvatus (Chai)

CONSERVATION IN SARAWAK

by Paul P.K. Chai

Sarawak has an area of 48,250 sq. miles. Of this about 70% or 34,000 sq. miles, are still covered in forest with the Mixed Dipterocarp, Peat Swamp and Mangrove forests comprising the major forest types. The minor types include the Kerangas (Heath), Limestone, Alluvial and Montane forests.

For management and conservation purposes, the forest may be classified generally into two categories namely:

(1) **Permanent Forest Estates**

There are forests set aside for the following purposes:

(a) assuring a sound climatic and physical condition in the State;

(b) the safeguarding of soil fertility and the prevention of erosion and flooding;

(c) the supply of water for domestic and industrial uses, and

(d) the supply in perpetuity of all forms of forest produce for domestic and industrial purposes.

A total of approximately 12,145 sq. miles have been constituted as Permanent Forests.

(2) **National Parks**

Apart from fulfilling purposes (a) to (c) listed above, National Parks are also constituted for the preservation of flora and fauna, unique land forms, historical sites and monuments, both for scientific purposes and the provision of educational and recreational facilities for the public.

Five National Parks have been constituted to–date, covering a total area of about 72,745 hectares. Another four, covering approximately 12,893 hectares, are being proposed. It is hoped to identify more suitable areas to be proposed as National Parks in future.

While the Government fully supports the establishment of National Parks, legal constitution usually takes a long time. This is partly due to the fact that a period of time has to be given for claims to part of the land or forest in the proposed area to be made by the local people, and a commission of enquiry has to be formed to look into and settle these claims before the constitu-

tion can be effected.

In addition to National Parks, wildlife sanctuaries have also been proposed for threatened species like the Orang–utan *(Pongo pygmaeus)*, the Gibbon (*Hylobates* sp.) and the Proboscis monkey *(Nasalis larvatus)*. Here again, the same problem is encountered with respect to land claims. Enquiries on one, the Semunsam Wildlife Sanctuary, mainly for the Proboscis monkey, have been completed and it is hoped that this will be constituted soon.

Within the forestry sector, many problems are also encountered as a result of the conflicting interest between logging and wildlife conservation. Obviously we have to strike a balance between the two in order to fulfill the objective of managing our forest resources on a multiple–use basis. The management and Wildlife people will have to work closely to decide on the best policy for a forest in order to achieve this objective. Ideally a forest may be zoned so that the more productive area can be earmarked for timber extraction and the less productive area set aside for wildlife conservation (sanctuaries) and water–shed management.

The same compromise will also have to be reached in logged–over forests. The current silvicultural practice in this forest is to remove all unsound trees by position–girdling. This has the following effects on the wildlife:–

(a) removal of the hollow trees which serve as nests for the hornbills (a protected bird);
(b) removal of many of the wild fruit trees which are sources of food for the animals and birds;
(c) a further widening of the gaps in the forest canopy thus restricting the movements of the arboreal animals.

Preliminary field observations by the Wildlife Section have indicated that this practice may have a damaging effect on the wildlife in the long run. However, more intensive field surveys over a wider area of forests will have to be carried out to confirm this so that sound recommendations may be put up to the Management Section to modify their management procedure in the interest of wildlife conservation.

National Parks should not only be considered as an amenity for tourists but also as store–houses for the conservation of plant and animal genetic resources for future research and development. Far–sighted planning is important as our Rain Forests are disappearing at an alarming rate to meet the demands of the ever increasing world population for raw materials and food cultivation. The genetic resources we conserve now may help solve the problem of food shortage for the future generations.

It is encouraging to note that the public is becoming increasingly aware of the need for the conservation of our natural heritage. Many rural dwellers have also expressed concern over the fast disappearance of forests and the scarcity of wildlife resulting from this. With the Government's effort and increasing public support, we are confident that the conservation programme in Sarawak will be implemented to the full.

The author is Ag. National Park and Wildlife Officer, Forest Department, Kuching, Sarawak, Malaysia.

Hornbill (Chai)

THE PARK PLANNING PROCESS

by Harold Kristian Eidsvik

There are as many approaches to park planning as there are planners. Because the resources and the relationships to the populations they serve are never the same, each park presents a unique situation. Two factors are critical to achieving a suitable plan. These are, first, a systematic approach, and second, sound judgments based on the testing of alternatives. This article outlines one approach.

A park may be based on marine resources, on land resources or on historic or cultural resources, or a combination of these resources. Each park is unique in its character and flavor. Except in the formulation of the planning team, to include experts in the special disciplines involved, the planning process does not vary greatly. Whether the park is a nature sanctuary or a recreation area, the process remains basically the same.

A park may be large such as Zaire's Virunga (800,000 ha) or it may be small such as Port-Cros in France (685 ha), but the planning process does not vary significantly.

Closely related to the planning process is the management process. Through management, ideally, guidelines are provided outlining legislation, policies and objectives which are the terms of reference with which the planning process begins. The management guidelines may lead the planner in different directions for each park, but they do not change the process except in relation to the amount of public participation which may be desired. The planning involvement decreases with the submission of the plan and its alternatives to management for decisions. As a part of the management process, the evaluation and refinement of plans should be assigned to a planning officer to ensure the continuity of the plan and the dynamism of the process.

The process of planning can be summarized as follows:

> "The process of preparing, in advance of action and in a reasonable systematic fashion, recommendations for policies and courses of action (with careful attention to their probable by-products, side effects or spill-over effect) to achieve accepted objectives" (Woodbury 1966).

The components of this definition describe a methodology which should permeate all planning, be it for a single park or for a park system.

Management guidelines for planning

The management process guides and controls the planning process. In turn, management is guided and controlled by legislation. Policies flow from legislation and are generally approved if not developed by management. Consistent with the policies, the objectives of individual units of the park system should be identified.

In the planning of a park, the planner should, where possible, review the legislation, policies and objectives spelled out by management as well as the specific guidelines he may receive. The understanding of these fundamental or basic elements will aid the development of plans which will become more than plans—they will become realities.

Specific legislative requirements or restraints will generally be clarified in guidelines. Suffice it to say at this time, a quick review of legislation will help the planner to understand the *raison d'etre* of the park in which he is involved.

There is no international uniformity of legislation as it relates to national parks and protected areas. The legislative approach in Britain places a great responsibility on local governments and agencies to manage park lands through zoning by local councils. In the United States, each national park has its own unique identity in an Act of Congress. In Canada, one federal statute governs all national parks. In Australia, each state has its own legislation. In brief, when planning a park, begin with the legislation.

A park policy is a statement by a government or an organization setting out the general principles it will apply to the management of its parks. It is often not written; it is often not available in one document; it is, however, a generally accepted way of doing business. Policy does not always have the binding force of legislation. A governing organization may say, for example, that it will adhere to IUCN or CNPPA crite-

Mt. Tarumai in Shikotsu–Toya National Park, Japan's "museum of volcanoes" in western Hokkaido (Photo: from Parks)

ria and standards. It is not legally bound to do so; however, because it is an IUCN member, the organization has elected to do so. In planning a park, the planning team must ensure that it has a clear understanding of organizational policies.

Continuing from the general to the specific, policies are followed by objectives. Specific objectives may be spelled out for a park just as they may be spelled out for an organization.

Some of the reasons for setting objectives are to provide direction, to aid coordination, to stimulate action and to provide measures for management control. Briefly, objectives are a tool to improve the planning and the decision-making process.

In *Man & Nature in the National Parks,* Darling and Eichorn said:

> ".... The only absolute administrative principle (for national parks) can be to consider first the ecological health of a park so that it shall endure for posterity" (Darling & Eichorn, 1967).

If we look at this for a moment as an objective, the main thrust is a concern for the ecological health of a park. This gives us a basis against which planning proposals can be tested.

The relevant factors to include in considering the physical and ecological character of a park include:

1. Size
2. Physiography, soil, geology
3. Water
4. Vegetative covering
5. Animal Life
6. Management and maintenance practices (Mattyasorky 1974).

When is a park ecologically healthy? When is this state of health impaired? These are difficult questions which do not have standard replies. Each park and each ecosystem within a park must be individually evaluated. There are guidelines:

1. The living organisms and their environments are inseparable and interdependent (e.g., wildlife and habitat).
2. The interaction between the elements and their environments leads to an exchange of material between the living and the nonliving parts.

This definition meets the criteria previously outlined and can be readily broken down into sub – objectives.

Achieving objectives in planning, then, must commence with a framework within which *the plan* becomes a part of the *means* of achieving an *organizational objective.*

Simply stated, the objective provides the planner and all others involved in the program with direction.

Park planning: dynamic, interdependent and continuous

The provision of an unbiased, comprehensive and interdisciplinary approach to the long-run solution of problems, with due concern to the action to be taken and the reaction which will occur, is the basic planning responsibility:

> "The steps in the planning process are interdependent. That is, the planning process is a circle of interdependence incorporating feedback and feed forward between the steps.
>
> "Feedback permits the planner to correct for future action in light of past experience. Feedback is inherent in all steps where actions are reviewed, amended or discarded" (Uleck).

Another important element of the planning process, also described by Uleck, is "replanning", it is a continuous process of valuation and re-valuation based on changing natural and/or social economic circumstances. The process is dynamic in that it is continuous and requires periodic review of plans every few years (i.e., 5 to 10).

Planning is also an interdisciplinary process. In this respect, Dansereau summarized the situation as follows:

> "The problems of natural resources utilization can neither be posed nor solved by one discipline alone. Therefore an efficient understanding of them awaits a better communication between the natural scientist and the emergence of a larger number of men capable of encompassing both aspects (social and natural sciences) and of acting upon this improved knowledge" (Dansereau 1957).

The role of management in the planning of a park is to first recognize that a plan is needed. This need may be identified during the budgetary process. It is often at this point that questions are raised relating to the purpose of specific projects and their

interrelationship to other projects. In developing a park there is an interdependence between all components. If the relationships are not clear, an inadequacy or lack of a plan may be indicated.

The planner responsible for a park must have guidelines to assist him in his planning. These guidelines should spell out the basic purpose of the park (its theme) as well as its secondary purposes. The guideline might also provide details on the time available for the planning project as well as personnel available. In addition, particular restraints should be described. Examples of restraints might be that no boundary changes will be considered, or that consultation with regional planning authorities must be carried out, or maximum and minimum budget levels; the need to adhere to existing policies could be confirmed or amended, if desired.

In preparing guidelines, management should review objectives for the park. Objectives should be reaffirmed where they are clear or, alternatively, the planning team should be requested to reassess objectives and submit revisions for approval at an early phase of the planning process.

The planner has a responsibility to identify objectives, to weigh the costs as well as the benefits of various alternatives, and then to recommend the course of action which seems to be the best way of achieving the objectives.

The following planning process relates closely to that of Uleck; it involves approximately 25 steps under four major headings. Each major heading will be discussed in detail on the following pages.

PLANNING PROCESS AND CHECKLIST

I. Management Responsibility

- Legislation
- Policy
- Objectives
- Guidelines

II. Resource Specialist Responsibility

Natural Resource Inventory and Analysis
- Climate
- Physical Resources
- Vegetation
- Wildlife
- Water and Wetlands
- Cultural Resources
- Planimetric and Topographic Details

Socio-Economic Inventory and Analysis
- Legal Structure of Region
- Government Authority
- Community Structure
- Population Characteristics
- Educational Levels
- Recreational Activities
- Social Organizations
- Land Ownership and Use
- Transportation Systems
- Tourism Activitives

III. Planning Team Responsibilities

Data Analysis

Natural Resources
- Rarity
- Representativeness
- Ecological Importance
- Scientific Importance
- Visitor Interest
- Recreational Capability

Socio-Economic
- Impact of Park on Local Population
- Impact of Local Population on the Park
- Impact of Park on Region, Nation, etc.
- Projections of Visitor Use
- Public Participation
- Information and Communication
- Infrastructure—Utilities, Access

Data Synthesis
- Review Objectives and Guidelines
- Determine Boundary Alternatives
- Test Zoning Alternatives
- Relate to Visitor Use Facilities
- Relate to Administration and Management Requirements
- Review Access and Circulation Systems
- Evaluate Impact on Environment of Alternatives
- Recommend Range of Alternatives for Public Participation
- Prepare Planning Documents for Approval

IV. Management Responsibilities

- Review and Evaluate Proposals
- Provide Written Direction Related to Approval and Funding
- Identify Responsibility for Execution
- Initiate Re-Evaluation Process

I. The Role of Management

Legislation, Policy, Objectives

1. Awareness of Need
2. Summarize Existing Situation
3. Prepare Management Guidelines
4. Establish and Evaluate Objectives
5. Test Proposal Through Outside Participation

The initial responsibility of management is to

recognize a need, to assess the situation and to recommend a course of action.

The provision of guidelines for the planner is a management responsibility. The statement should be framed in relation to the realities and the restraints, such as capital and manpower, which are forecast for the future. Dr. Coleman Woodbury (Woodbury 1963) has suggested that the omission of capital programming in the planning process is simply the adult equivalent of writing letters to Santa Claus—if cost is ignored, planning is just so much wastepaper.

In addition to providing guidelines, management may wish to test the proposal by presenting it to an advisory board, to elected officials, to public organizations, or perhaps, through a public participation program, to a wider audience.

II. The Role of Resource Specialists

Inventory, Analysis, Research

1. Assemble Socio-Economic Data
2. Assemble Resource Data (Natural and Cultural)
3. Assemble Base Data Relating to Relevant Regional Development
4. Analyze Available Data in Relation to Needs
5. Outline Additional Data Needs
6. Initiate Program to Obtain Essential Data.

The collection of background data through field studies and the evaluation of existing maps, plans, surveys, visitor use studies and economic reports is an essential beginning point for the planner. The work may be carried out by specialists in a variety of professions or, in the situation where resources are limited, by an individual.

In addition to assembling data on the proposed park, it is essential to consider the region surrounding the park and its interrelationships in a present and future sense.

The information should be thoroughly analysed and evaluated. It should then be summarized to present an overview to be incorporated in the planning document.

The resource specialists would also at this time outline future research requirements as well as areas requiring more intensive inventory. Through this process the data bank expands and provides more precision for future revisions of planning documents. In addition to providing for planning purposes, the data base is essential to the development of management plans and interpretive or information programs for the park management team.

William Mott, the former Director of California's Department of Recreation and Parks, described the process as follows:

"Today we must do environmental planning. What does that mean? It means that we have to look at all of the resources within an area to be planned, and make an inventory of those resources. We have to use the technical skills and knowledge of not just landscape architects but architects, engineers and planners, plus the skills and knowledge of archeologists, historians, environmentalists, foresters, botanists, etc., each contributing to the planning process so that the total environment and the relationship of its parts are fully recognized and taken into consideration in the plan.

"In addition, the planning process must include use of the skills and knowledge of psychologists, sociologists and cultural anthropologists. The social scientist can be of great help in planning parks for people. Today, if we're going to do a total planning job so that parks will be relevant to today's needs, we must utilize the ability and knowledge of planners as well as the knowledge of people from the natural and social science disciplines. " (Mott 1965)

III. The Role of the Planning Team

Analysis, Synthesis, Alternatives

1. Analyze Available Data
2. Outline Scope of Problem
3. Evaluate Trends—Futures
4. Outline Alternative Proposals
5. Test Proposals Through Outside Participation
6. Prepare Provisional Plan
7. Present Provisional Plan for Management Approval
8. Prepare Master Plan or Sectorial Plans
9. Present Plan for Public Review
10. Prepare Revisions as Necessary

The person in charge of the planning team is primarily a coordinator, a communicator and a facilitator. It is his responsibility to pull together a diversity of opinion and factual data to create a whole out of myriad parts.

The evaluation process is an analytical process in which the planner must critically assess the data available. He must discover weaknesses as well as strengths. To do this he must pull things apart and examine the pieces.

Once the information available has been analyzed, it may be necessary to search out additional background data and to repeat the process.

The creative portion of the planning process begins with problem definition. Knowing the information available as well as the management objectives, the planner must now begin to synthesize or bring together all of the components to create a new whole.

The component data must be assessed in relation to their potential roles in a new management situation. This evaluation must be exercised in relation to current situations as well as future trends.

A Canadian periodical describes the process of analysis and synthesis as follows:

> "Synthesis, putting things together, calls for the mental skill we call creative thinking. It is much different from analysis and therefore from analytical thought. Analytical thinkers are typically critical rather than creative. They enjoy pulling things apart or even tearing them down. Creative people are builders. They like to 'get it all together'.
>
> "Creative thinking is a process for putting things together. It is synthesis. The invention of the airplane put together the glider, the internal combustion engine, and the propeller. All of the elements already existed. The new pattern was first put together in thought. Then it was transformed subsequently into a reality. Thus, through synthesis, the world obtains its new things.
>
> "It is not too much to describe synthesis as the magic which holds the universe together. In synthesis, the whole becomes greater than and different from the mere sum of the constituent." (*Insights* 1976)

In preparing park plans, one is in reality taking a great number of existing facilities or landscape characteristics and developing a new relationship between them to facilitate their use and/or preservation by man.

Alternatives must be developed and tested through exposure within the organization; it is desirable, as well, to search out a broad range of external opinion. In simple terms, the least costly time to initiate change is during the planning process. The evaluation of alternatives at an early stage is perhaps the best method to ensure the implementation of the best alternative.

In developing the "park concept", the planner is primarily concerned with how the native qualities of the landscape can best be presented in relation to human needs and in harmony with the stated policies of the agency. On the basis of the available data he must determine the type of park development which would complement the landscape and be in harmony with the overall character of the area. Developments which would be incongruous in a wilderness might be highly compatible and, in fact, desirable in other types of parks. The park concept is not a fixed or pre-determined notion but is an expression of the park character. Its validity is dependent on the planner's knowledge of the park and is subject to revision as that knowledge expands and crystalizes.

> "Perhaps the planning process can best be explained as a series of subconscious conversations which the planner has with himself—the question posed, the factors weighed, and then the recorded conclusion. The more lucid the thinking, the more coherent the powers of idea communication . . . the better is the plan." (Simonds 1961)

Various terms such as preliminary master plan, provisional plan, conceptual plan, etc., have been used over the years to describe planning documents. In brief, they all express the fact that planning is a continuous process in which initial plans are presented in revised forms under new titles.

For essential buildings in national parks and reserves, it is a good practice to use locally available materials, and follow architectural styles indigenous to the area. The visitor center at Varirata National Park, Papua New Guinea, provides an excellent example. (Photo: Metcalf/Teng)

Current planning policy in the United States suggests that the term master plan implies an unrealistic degree of permanence and that the term "management plan", which is a composite of resource plans, interpretive plans, operational plans, etc., is perhaps a more accurate description of both the process and the end result. The document resulting from the process of planning a single park is a synthesis of a number of sub-plans. Formerly this document was called a master plan.

As a comment on this brief review of the planning process, it is suggested that its greatest weakness rests in the presentation and approval process. Planners are often imbued with the idea of major change; the process leads them in this direction. The net result is often the production of idealistic schemes which are often not attainable within budgetary or management restraints. In essence, a great number of managers are not preconditioned to think in 10-, 15- or 20-year terms. This suggests that long-term plans should be developed in component phases which can be achieved within budgetary time periods, and which do not require management to make major long-term decisions in the terms of current knowledge. In essence, planners should seek only approval in principle of long-range concepts. The components which lead toward the concept through a series of development programs should be "self-contained" and approved within a five-year financial plan.

IV. The Continuing Role of Management

Evaluation, Approval, Establishment and Re-Evalution

1. Evaluate Plan and Provide Written Approvals and Modifications
2. Identify Responsibility for Execution
3. Establish the Park
4. Initiate Plan Re-Evaluation

The planning process begins with the management role; it also ends with it. In brief, management must foster the planning process, it must make decisions approving, rejecting or modifying plans, and it must re-initiate the process through continuous evaluation.

To reiterate, the planning of a park must be viewed as a part of a broad process:

> According to John Owen, "few of the world's parks are large enough to be, in fact, self regulatory ecological units; rather most are ecological islands subject to direct or indirect modification by activities and conditions in the surrounding areas." (Owen 1972)

Circumstances within and surrounding parks frequently change with time; it is, therefore, essential that the planning process be dynamic, involving constant re-assessment of initial proposals or plans.

Public participation in the planning process is becoming more and more vital to the achievement of objectives.

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Mr. Iglit, home of the Philippine tamaraw (Hum. Sett. Off., Dev. Acad. of the Philippines)

WILDLIFE CONSERVATION IN THE PHILIPPINES.

by I.R. Grimwood

The importance of wildlife conservation in the Philippines is enhanced by the high degree of endemism that occurs in the attenuated Indo-Malayan fauna that reaches that archipelago. Of the 380 resident birds recorded by J.E. duPont (1971) about a quarter are endemic species and he lists a further 560 endemic sub-species. Similarly, more than half of the 180 species of indigenous mammals listed by G.L. Alcasid (1970) are endemic. Those include, amongst the smaller forms, over 40 of the 77 recorded bats (4 genera are endemic and another 4 shared only with Sulawesi); all 13 of the insectivores (a monotypic genus of gymnure and 12 shrews); all 16 species of squirrels, and most of the 52 species of rats and mice (representing 14 genera, of which no less than 11 are endemic to the Philippines). Of the 22 remaining larger mammals 8 are endemic (the Palawan porcupine, Philippine tree shrew, Palawan tree shrew, Philippine tarsier, Philippine flying lemur, Palawan stink badger, the tamaraw and the Calamian deer – with the porcupine and Philippine tree shrew representing monotypic endemic genera), while no less than 8 races of the sambar deer are recognised from different parts of the archipelago.

Unfortunately the very endemism which makes conservation measures so important makes them at the same time more difficult, because most of the birds and mammals concerned occur only on a single island or group of islets. It is therefore not enough to set aside two or three large general purpose conservation areas, as it is sometimes sufficient to do in mainland or less geographically divided countries. Instead a large number of separate conservation areas are needed, spread over a wide range of islands, yet each of those must still be large enough to provide the full ecological requirements of the species it is intended to preserve.

This calls for an exceptional conservation effort in itself, but the situation is made more difficult by the fact that most of the islands have been heavily logged to meet the recent timber boom which, combined with an ever growing demand for more agricultural land, makes undisturbed areas of forest, on which most Philippine wildlife depends, extremely hard to find.

So little is known about the habits of most birds and small mammals that the only approach is to establish reserves covering as wide a range of ecosystems as possible, in the hope of preserving viable populations of all the species inhabiting that region. However, many of the larger mammals, and some birds, have been so extensively hunted that additional special species-conservation reserves will be necessary if they are to be saved.

Of all the large islands Palawan (including the small Calamian group off its northern tip and Balabac and Bugsuk Islands to the south) has the richest and most distinct fauna. That is because it lies on the Sunda shelf and has been colonised by numerous birds and such animals as the pangolin, clawless otter, binturong, short-tailed mongoose, leopard cat, Sumatran or bearded pig (which replaces the Javan pig of the rest of the archipelago) and the greater mouse deer (on Balabac Island only) which have been unable to extend their range to the rest of the archipelago. In fact the only large mammals it has in common with the other islands are the ubiquitous crab-eating macaque and the oriental and palm civets, whose wide dispersion may owe something to human agency.

In addition to those more widespread forms, Palawan has a large number of endemic species of its own. Those include the Red Data Book (RDB) Palawan peacock pheasant amongst the many birds, and the Palawan tree shrew, two squirrels of the genus *Callosciurus,* a flying squirrel of the genus *Hylopetes,* the Palawan porcupine and the Palawan stink badger amongst the larger mammals, while the Calamian deer and three more species of *Callosciurus* squirrels are endemic to the Calamian Islands.

To cover all of those, as well as the commoner species, at least two conservation areas are necessary on the main island, one in the north and one in the south. A third is needed to protect the threatened and RDB Calamian deer and the three squirrels endemic to those islands, while a fourth will be required on Balabac Island if protection is to be given to the mouse deer.

Mindanao is the next richest in fauna of the main islands. It has a wide range of endemic birds and a number of endemic mammals, as well as the Javan pig and sambar deer, the crab-eating macaque, two civets and a few small mammals that it shares with the other non-Sunda shelf islands. Notable amongst the endemic mammals are the RDB Philippine gymnure, the Philippine flying lemur, the Philippine tree shrew, the Philippine tarsier, two squirrels of the genus *Callosciurus,* two pygmy squirrels of the genus *Nannosciurus* and a flying squirrel of the genus *Hylopetes,* while there are two endemic sub-species of the sambar deer. The most notable of the birds is the highly endangered and RDB Philippine eagle, although that species is not wholly endemic to Mindanao because, like the flying lemur and tarsier, it has been able to extend its range northward onto the nearest of the Visayan Islands, i.e. Bohol, Leyte and Samar.

Little is known of the distribution of even the larger Mindanao mammals, although most seem to be somewhat localised. The minimum requirement in the way of conservation areas would therefore be large ones in both the east and west of the island, both covering altitudinal ranges of from sea level to the mountain tops at over 2,400 m. Protective measures are also needed on the small island of Basilan, off the tip of the Zamboanga peninsula, because it has its own dwarf flying squirrel of the genus *Petinomys,* two endemic pygmy squirrels of the genus *Nannosciurus,* and two more sub-species of the Sambar deer. Thought should also be given to the protection of the slow loris, which reaches the extreme eastern limit of its recorded range on the island of Tawtawi, in the Sulu archipelago to the south of Basilan.

The Visayan Islands have few large mammals and none of them are endemic, except for one species of *Callosciurus* squirrel and one species of *Nannosciurus* pygmy squirrel, both of which occur on Samar Island (the northernmost point reached by any squirrel) and for a sub-species of sambar deer which is common to most of the islands. However the Visayas have a large number of endemic birds, including the RDB Cebu black shama, which is found only on the island of that name.

Mindoro Island is famous for being the home of the endangered and RDB tamaraw, which is now re-

Philippine eagle (Vollmar)

duced to some 200 individuals, all contained in a national park established for their protection. It also has its own distinctive race of sambar deer and a number of endemic birds, including the RDB Mindoro imperial pigeon.

Luzon Island, in the north, is poorest in large mammals of all the main islands. However it is notable for a number of rodents, belonging to no less than eight endemic genera, which are restricted to the mossy forest zone of certain mountain tops in the north of the island, where a national park is planned. Luzon, too, has its own endemic race of the sambar deer and, like most of the other islands, a wide range of endemic birds, including the RDB Koch's pitta.

Besides its terrestrial fauna the Philippines has a much threatened endemic crocodile, and must also accept a share of responsibility for the survival of certain widespread but endangered animals that occur in its seas, such as the dugong, estuarine crocodile and the sea turtles. It has a particular responsibility in the case of the green and hawksbill turtles, because one of the most important nesting places of those species in all S.E. Asia is a group of islets, known as the Turtle Islands, which the Philippines shares with Sabah. Sabah has effectively protected the islands on her side of the boundary, and made them a national park, but the Philippine islands are still unprotected.

As has been said earlier, the large number of endemic species it is responsible for calls for an exceptional conservation effort on the part of the Philippines, particularly because many of those animals are now seriously endangered. There is already an extensive and long established system of over 60 national parks and reserves, but unfortunately those fall far short of meeting all requirements. Some of the parks serve only to protect monuments or historical sites, or to provide recreation areas for city dwellers, and the remainder cover an inadequate range of biomes (e.g. there is only one small park on Palawan), while legal provisions afford them very little security. A committee of the Philippine Development Academy, which was commissioned to make a study in 1975, further reported that many of the parks have been logged and most of them have been invaded by settlement, so that very little natural vegetation remains in some cases, while the integrity of all is threatened by undemarcated boundaries, lack of law enforcement and inadequate staffing and financial provisions.

The committee recommended sweeping reforms, including new legislation, the overhaul of administrative arrangements, the abolition of those parks which no longer serve a useful conservation purpose, and the replacement of the present system with a pattern of 12 national parks, 7 national wildlife sanctuaries and 2 strict nature reserves, some of which would be the still viable parts of existing parks and others new ones.

It is now two years since the committee made its report and it is to be hoped that most of its recommendations will soon be put into effect. In addition, more special campaigns are required, similar to those initiated in 1969/70 to save the tamaraw and Philippine eagle, for such particularly threatened animals as the Calamian deer and Philippine crocodile. Protection is also needed for the Philippine islands of the Turtle Islands group, the whole of which would ideally be treated as a single conservation unit under the joint administration of the Philippine and Sabah authorities.

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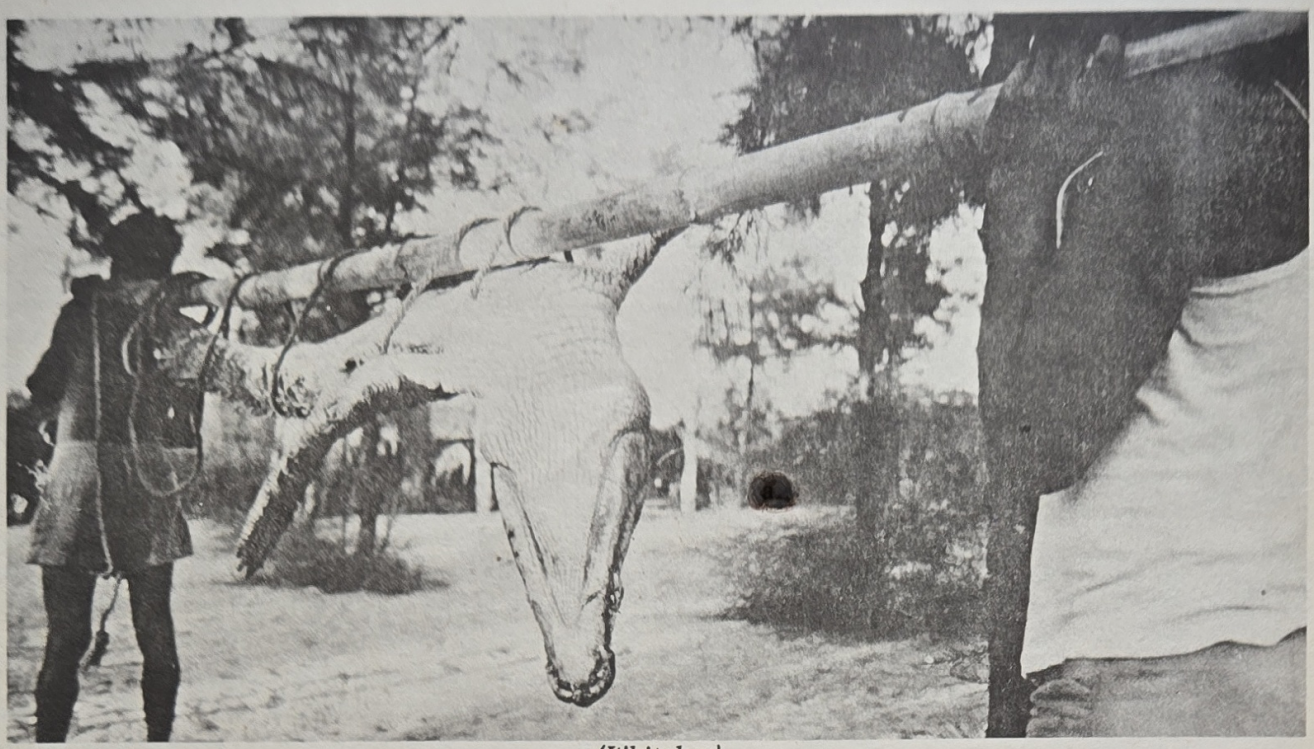


(Whitaker)

THE STATUS OF ASIAN CROCODILIANS

by R. Whitaker and R.C. Daniel

Crocodilians have been singularly unsuccessful in the 20th century. Many of the generally recognized 22 species now survive exclusively in national parks, protected preserves and in farms and breeding stations. This is due mainly to (a) the hunting for skins on a very wide scale with, till recently, very little or no restrictions on numbers and seasons and (b) to habitat loss. The world market for crocodilian skins used to peak over 2,000,000 skins per annum.

Crocodilians in India

The three species of Indian crocodilians are the mugger or marsh crocodile *(Crocodylus palustris)*, the saltwater or estuarine crocodile *(Crocodylus porosus)* and the gharial *(Gavialis gangeticus)*. Of these the mugger has been the most successful ecologically, adapting to a wide habitat range from hill streams and rivers to ponds, marshes and lakes. Gharial are restricted to the northern rivers and estuarine crocodiles to coastal creeks and mangrove swamps.

Former Range and Abundance

Mugger were extremely common in their former wide range from Dasht in the extreme west of Pakistan to Assam in northeastern India, over most of the peninsula and also in Sri Lanka.

Estuarine crocodiles were once plentiful in the Sunderbans in West Bengal, Bhitar Kanika in Orissa and the Andaman and Nicobar Islands, since these areas support extensive mangrove swamps and tidal creeks. Other populations which also existed along the southern east and west coasts were already rare in the 1940's and are now absent. Kerala's SW coast, which now has no more mangrove, evidently once had a substantial population of estuarine crocodiles.

Old accounts, like those of Andrew Leith Adams (1867), show how plentiful gharial used to be in northern rivers: "The gavial or Indian alligator. . . abounds in all the great rivers of Northern India. . . Ten or twenty may be frequently seen together. . ." Their range extended throughout the Gangetic system, west to Pakistan and north–east to the Brahmaputra, with an isolated population in Orissa in the Mahanadi. Another early naturalist, Hornaday, in 1880, reported seeing 24 gharial in two hours on the Yamuna River, not far from Allahabad.

Depletion

The general reasons for the decline of the three species are uncontrolled and all season hunting for hides, meat, "medicine" and for sport; killing by fishermen; extensive collection of eggs and loss of habitat by dam construction, river diversions, agricultural and forestry activities, water pollution and human disturbance and encroachment. It was recently observed that the gharial on the Karnali River (a group of seven adults) in western Nepal failed to breed in '76 because of the disturbance caused by a dam feasibility project (Whitaker, 1976). Natural predation in crocodiles especially in the egg and hatchling stage is very high and gains importance in dangerously low populations, as is the case with India's three species. It is estimated that only 1–2% of hatchling crocodiles reach adulthood in nature.

The Skin Industry

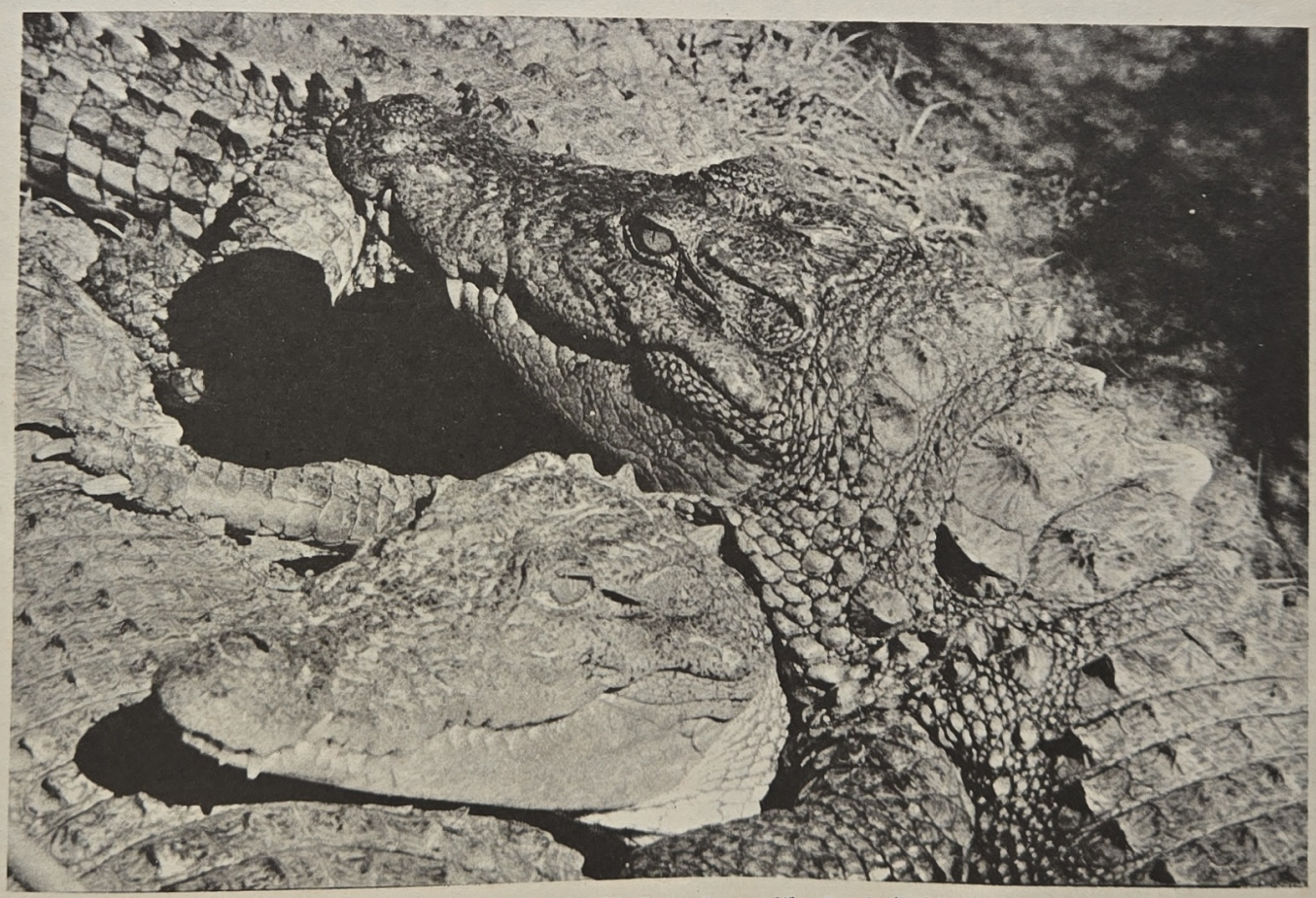
A few people once made considerable profits on crocodile skins. Fishermen supplied the skin markets of Agra and Kanpur whereas in other areas tribal crocodile hunters (some operating throughout the North) supplied middlemen. In some parts of the country one or two "specialist" hunters were apparently responsible for wiping out considerable populations.

With the 1972 ban on crocodile killing the skin market went underground. The value of crocodile meat, fat, gall bladder (for medicinal uses) and other parts still makes it worthwhile to kill crocodiles without the danger involved in selling the skin.

The only available statistics on the Indian crocodile skin industry are for 1964–65 when a total of Rs. 25,948 worth of skins were exported to U.K. and France. The absence of statistics makes it difficult to assess the size of the industry.

Legal Status and Protection

Before the export of crocodile skins from India was controlled in 1969 (Instruction No. 57/75), crocodiles in some areas received protection as religious symbols. In some parts of Kerala it was customary to have a resident mugger in temple tanks and these were zealously protected by the villagers. The famous Mugger Pir near Islamabad in Pakistan still exists today and here the last three resident mugger are venerated and fed by the local people. Effective and thorough paper protection for Indian crocodilians was only accomplished in 1972 (Wildlife Protection Act, 1972). The three species are listed under Schedule 1 of the Act, rendering the killing, trapping, transporting or being in possession of a crocodile or its products without a special permit illegal with a penalty of up to 6 months imprisoment and Rs. 2,000 fine.



Sub-adult mugger at Madras Crocodile Bank (Whitaker)

The fish-eating gharial (Whitaker)

Beneficial Role of Crocodilians

In his monumental field studies on the Nile Crocodile (1961), Hugh Cott concludes that in many areas crocodiles feed almost entirely on the predaceous catfish *Clarias.* He states "The importance of the crocodile in relation to the *Tilapia* fishery is clearly seen in the conditions at present obtaining in Mweru Wa Ntipa, where the reptiles are very plentiful and strictly protected. In this lake they tend to be monophagous, feeding extensively upon *Clarias mossambicus* but apparently not upon *Tilapia* which is the main producer of animal protein from vegetable matter and the important commercial fish. *Clarias* preys heavily on *Tilapia*, and in so far as the crocodile keeps *Clarias* in check there can be little doubt that it is beneficial". Dr. Cott goes on to describe the role played by young crocodiles in feeding on important invertebrate fish predators such as giant waterbugs *(Belostomatidae)*, water beetles *(Hydrophilidae)*, crabs *(Potamonautes)* and aquatic spiders *(Dolomedes)*.

In South Asia crocodiles once performed a valuable service scavenging in the rivers and tanks. The sight of numerous corpses on the Jumma River near Allahabad during crocodile survey work was a grim reminder of this absence. Dog packs now roam the steep embankments and sand bars of the holy rivers.

In many parts of India crocodile decline has been concommitant with fish yield decline and/or drastic changes in catch composition. The predatory species are evidently gaining the upper hand, possibly because of the absence of crocodiles. V.G. Jhingran (1977) states "The population of predatory fish viz. *Mystus* spp., *Channa* spp., *Wallago attu, Silonis silondia* and others dominated the catches of many reservoirs. . . Effective control of these and other predatory fishes is imperative for building up a population of commercially important fishes feeding on lower food chains".

Chart I Percent Catfish in total catches at 3 reservoirs

Sandasogar (U.P.)

1963–64	36.8%
1964–65	39.8%
1965–66	60.9%

Stanley (T.N.)

1962–63	30.0%
1963–64	34.6%
1964–65	50.1%

Bhavanisagar (T.N.)

1964	31.49%
1965	58.37%
1966	50.77%

Chart I shows the trend of steady increase in

Chart II Reservoirs in Tamil Nadu
Fish Catch per Unit Effort (Kg/Year/Unit)

Reservoir	1974–75	1973–74	1972–73	1971–72	1970–71	1969–70	1968–69
Stanley	2,146	2,000	848	850	860	570	84?
Bhavanisagar	8,947	7,323	6,709	5,374	9,400	8,400	7,05?
**Santhanur*	12,525	9,427	9,684	11,315	10,926	10,319	6,75?
Krishnagiri	3,936	3,914	5,190	3,946	4,950	3,780	6,75?
**Amaravathy*	10,167	21,920	21,950	18,950	18,940	16,700	4,67?
Tirumoorthy	8,215	6,935	6,083	9,109	12,800	8,745	16,06?
Sandynulla	2,750	2,120	2,280	3,129	2,880	3,062	—

the undesirable predatory cat fish. Certainly other factors are at work but it is obvious that crocodilian control of predaceous fish should be examined and trials implemented in a sample area. The dramatic increase in catfish catch percentages roughly correlate to the licensed wiping out of most of the last reservoir populations of mugger in Tamil Nadu.

Chart II shows an interesting trend in fish yields. Sreenivasan compiled the table and gives explanatory data in his exhaustive limnological reports. *In the light of the roles of the crocodile in selective predation and the nutrient cycle it would be worthwhile to examine the correlation of Tamil Nadu's two highest crocodile populations (Amavarthy & Sathanur Reservoirs) with the State's highest fish yields.* It is sincerely hoped that the Fisheries Dept. in particular will be interested in examining these intricate inter–relationships.

Status at Present

Mugger

Tamil Nadu

1. Chidambaram Waterworks: 15 – 20 mugger
2. Kilikudu "Crocodile Farm": about 20 mugger, including at least 5 breeding females
3. Mettur Reservoir: less than 10 mugger
4. Sathanur Reservoir: about 12 mugger with at least 5 breeding females
5. Bhavanisagar Reservoir: maximum 10
6. Kedarhalla Stream and Moyar River: There are several breeding pairs of mugger at these beautiful natural crocodile habitats adjacent to Bhavanisagar and contiguous with Mudumalai Sanctuary. It has been recommended as a Crocodile Preserve.
7. Amaravathi Reservoir: This is Tamil Nadu's largest breeding population of mugger with at least 12 egg–laying females and a total of about 25 adults and sub–adults. This is a State Crocodile Project site.
8. Hogenekal Falls: This is one of the only wild areas left on the Cauvery River. Several of the deep pools contain one or two adult mugger, and this is an important "alternate habitat" to the Mettur Reservoir. It is a State Crocodile Project site.

Tamil Nadu has less than 200 wild crocodiles; however, unfortunately, this is possibly the largest population among all the Indian States.

Karnataka

There are probably less than 150 wild in the State. A State Crocodile Project has been started at Bannerghatta National Park near Bangalore

Kerala

It is unlikely that the total wild population in the State exceeds 30. The Forest Department has recently initiated rearing stations near Neyyar Reservoir.

Andhra Pradesh

Probably less than 50 wild in the entire State.

Maharashtra

Seems the entire wild population does not exceed 100.

Gujarat

Gir National Park has a substantial breeding population of mugger (total over 50).

Uttar Pradesh

8 or 9 mugger live inside Corbett National Park on the Ramganga. A large scale crocodilian rehabilitation project has been underway since 1975.

Saltwater Crocodile

West Bengal

A few estuarine crocodiles remain in the Sunderbans but so far no one has done a nocturnal census. The Forest Department has a project underway for the rehabilitation of this species.

Orissa

A significant population of estuarine crocodiles exists in the Kanika Islands (Mahanadi delta) which is now a Sanctuary for this species. A State Forest Department rearing station has been established near Dangmal where over 100 young *C. porosus* are being reared. At present there are probably less than 200 wild *C. porosus* on the Indian mainland.

Destruction of mangroves in the Andamans is already affecting the nearly coral reefs (Whitaker)

Andamans and Nicobars

No overall census has been carried out but the crocodiles are shy, obviously heavily hunted (Whitaker, 1976). As late as 1969 groups of hunters from the mainland devastated local populations for skins. Areas like Diglipur in North Andaman were once famous for crocodiles; now, with settlers and encroachments using up the last fresh water drainages for agriculture, the crocodile is being inexorably pressured out of existence. Little Andaman and the Nicobars still hold important populations. In the Andamans and Nicobars crocodiles could form the basis for a large forest–based industry which could contribute to the survival of the idigenous tribes. Approx. figures: N. Andaman 100–200; Middle Andaman 50–100; S. Andaman 20–30.

Gharial: *There are at present only about 100 wild gharial in India and an additional 50–70 in neighboring countries*

Uttar Pradesh

1. Kateraniaghat, Girwa River: Supports India's largest wild gharial population. 34 have been recently counted here. (Basu, pers. comm. 1978)
2. Ramganga River: 4 or 5 gharial. A rearing station at Kateraniaghat and Kukkrail near Lucknow where over 750 young gharial are at present being reared.

Rajasthan

Over 40 gharial survive.

Madhya Pradesh

1. Mahanadi River: 1 or 2 may be seen seasonally.
2. Tons River: A few gharial may survive.
3. Jamuna River: Gharial are still sometimes seen.
4. Ken River: A small population survives.

Orissa

7 adult gharial survive in the wild. Here a State Project is underway and over 100 young gharial are being reared for release.

Assam

A maximum of 10 live in the great Brahmaputra and its tributaries.

Bihar

5 or 6 gharial inhabit the Gandak and Kosi Rivers (Bustard, 1976).

Crocodilians in India

Census Estimate (wild, including all sizes)

C. palustris	2–3,000
C. porosus	200 (mainland)
G. gangeticus	100

Sri Lanka

Both mugger and estuarine crocodiles occur in

Sri Lanka. Mugger are still common in some areas. In a recent survey, 300 mugger were counted and the total population estimated at 3,000. The status of *C. porosus* is not so healthy, our survey estimated a total of 500–750 for the Island. In 1975 86 crocodile skins from an unknown address in Sri Lanka were seized by Indian Excise Authorities at Pamban. Poaching for meat is now the major threat. (Whitaker, 1977)

Burma

Export of skins continues but only small isolated populations of the estuarine crocodile remain. Mugger and gharial have long been extinct (if their existence in Burma was ever confirmed).

Pakistan

Very few gharial and some mugger remain. Strict paper protection exists and there is some effort underway by the wildlife authorities to rehabilitate the two species. The most recent field report mentions 2–3 gharial remaining between the Sukkur and Guddu Barrages (Pilleri, 1975).

Bangladesh

Gharial seem to be extinct and a small population of *C. porosus* still exists in the Sunderbans. Mugger have not been reported in recent years.

Nepal

Gharial can still be seen in small numbers on the Karnali, Babai, Rapti Doon, Narayani, Makali, Rapti and Kosi Rivers. Mugger co–exist with gharial in several of these areas. The total population of gharial in Nepal is about 50 with the major group in the Chitawan National Park area of the Rapti Doon and Naryani Rivers (15–20).

Thailand

According to recent information received from C. Youngprapakorn (pers. comm., 1977) the Malayan Gharial *(Tomistoma schlegelii)* is extinct in its former southern Thailand range. U. Youngprapakorn (1977) reports that *C. porosus* is down to about 10 individuals in southern Thailand. The only known wild population of *C. siamensis* are a small number at Boraphed Lake in Nakhorn Sawan Province. Mr. Youngprapakorn's farming operation has approximately 23,000 crocodiles, the majority *C. siamensis.*

Malaysia, Borneo, Indonesia, Java

Very little information has been received since 1973. Apparently *T. schlegelii* survives in Borneo and Indonesia in breeding numbers but is very rare in Malaysia. *C. siamensis* has been reported in Borneo and Java (Neill, 1971) but nothing further is known of this crocodile's status nor that of *C. porosus* in that region. Similarly, there is no recent information from the Celebes, Moluccas and the rest of the archipelago.

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9–month old tiger, Tigerhaven, India (Kuper)

PROSPECTS FOR INDIA'S WILDLIFE

by Zafar Futehally

The status of a country's wildlife depends primarily on the government's national policy. Fortunately our government has decided that India will be much the poorer both spiritually and materially if its wildlife is allowed to collapse. So although there is no denying that there is conflict in several areas between the immediate interests of humanity and wild animals, the administration is trying its best to contain it, in the hope that in the long run this policy will be wholly beneficial for the people. The Indian Board for Wildlife, the National Committee on Environmental Planning and Coordination, and the Steering Committee on Project Tiger are all trying to ensure that the interests of wildlife are not disregarded in our development plans.

Let us see how this conflict arises. The larger animals of India, the elephant, the Indian bison, the sambar, and the tiger, to name a few, are essentially dwellers of forest. As a result of human pressure the plains' forests have almost disappeared from our country, and the 20 percent of the land surface which is now under forest cover is mainly in the mountains. In many cases the mountains have within them the catchment areas of rivers which form part of hydroelectric or irrigation projects. These mountains are also well wooded areas and with advance planning and imagination could be retained as wildlife sanctuaries and nature reserves. Because the catchments of these projects must remain well covered with vegetation to prevent soil erosion and siltation of dams lower down, such projects are excellent testing grounds for the principle that conservation and development can proceed hand-in-hand. The areas actually coming under development are not very large in most cases, but the problem has been that once a pristine forest is made accessible by roads and the project staff and laborers are settled in the locality, the fate of animals is sealed unless vigorous protection measures are enforced.

Hydroelectric projects are by their nature sited in forested areas in mountains, and new giant projects are on the anvil. The Kudremukh Iron Ore Company, Limited, financed by Iran, will be the largest open cast mining company in Asia. It is sited in the Western Ghats, and the mining area is surrounded by evergreen forests rich in wildlife. The Western Ghats is a range of mountains extending a thousand miles north to south along the western coast of India. These mountains arrest the movement of rain-laden clouds which travel eastward over the Arabian Sea and are responsible for the country's principal rainfall. Because of the new awareness of the need to protect the environment, the project authorities have decided to take firm steps to ensure that the neighboring forests and their denizens are fully protected.

In the Idukki project in Kerala, an area of seventy square miles has been designated as a wildlife sanctuary and in course of time is likely to become a spectacular reserve. The reservoir created by inundation of the valleys is buttressed by lush evergreen forests, and during a recent visit we saw several herds of elephants grazing peacefully in this secure

habitat. We also found cormorants and darters nesting in some of the islands within the magnificent waterspread which covers an area of twenty-three square miles; and if proper ecological steps are taken, this sanctuary can demonstrate that with imaginative planning wildlife can be encouraged to prosper even under somewhat artificial conditions.

Though many of the smaller mammals and almost all bird life exist outside our sanctuaries, the case of the larger herbivores and carnivores is quite different. They need protected localities and natural habitats if they are to survive. With the plains almost wholly under agriculture and human use and the mountains being increasingly opened up, wildlife will be secure only in sanctuaries. More than 150 sanctuaries exist today covering a modest 0.5 percent of the land area, and several more are being contemplated. Although essentially meant for wild animals, sanctuaries in India are continuing to be exploited for silvicultural purposes.

There has been considerable discussion about the effects of forestry operations in wildlife habitats. According to some, these operations are very deleterious, for disturbance by humans seriously affects the life cycle of wild animals. Others take the opposite view and point to the fact that in the tourism zone of some of our sanctuaries there is more wildlife to be seen than in the truly wilderness zones. Some naturalists feel that, provided there is adequate territory, nature can be left to find its own balance. Others are more in favor of managing the habitat, recognizing that the best policy is to have well-wooded regions interspersed with open meadows. The edges of such habitats seem to hold a great attraction for wild creatures, apart from the fact that open areas with more sunlight produce a lot more forage for herbivores than comparable areas under tree cover.

Of the 500 mammal species and 1,200 bird species of India, the most endangered ones are those whose habitat requirements are very special and whose demands for territory are rather large. The elephant, for example, requires almost 250 kilograms of browse and grass per day, so that extensive wild country is necessary to provide it with food and shelter. A recent survey carried out by a team of ecologists of the Indian Institute of Science, led by Professor M.D. Gadgil, estimates the total elephant population of south India (the best habitat in the country for this animal) at 4,000. They say that "more than direct poaching the most serious threat to this population of elephant is the alarmingly rapid and continuing fragmentation of its habitat due to a variety of reasons ranging from deforestation, extension of plantations, agriculture, dams, and other construction activities." The best hope for the elephant rests on the fact that the forests of the Western Ghats are intended to be preserved for their ecological functions; and with the saving of the habitat, this intelligent pachyderm, so closely associated with India's cultural history, is also likely to survive.

Like the elephant, the future of the Indian bison *(Bos gaurus)*, in many ways one of the most striking of wild herbivores, is also connected with the preservation of its forest habitat. But these animals are unfortunately very susceptible to diseases, particularly rinderpest, communicated through domestic cattle; and in 1968 one of the finest herds in the sanctuaries of Bandipur and Mudumalai was almost wiped out. Since then domestic cattle passing through these sanctuaries are inoculated against this disease; and although the menace has been checked, recent deaths in the Periyar Sanctuary indicate that constant vigilance is necessary.

Of the other herbivores some like the Kashmir

Great Indian Rhino, Kaziranga N.P. (Kuper)

Manipur brow-antlered deer, Delhi Zoo (Kuper)

stag *(Cervus elaphus hanglu)* and the hardground barasingha *(Cervus duvauceli branderi)* are slowly building up their numbers under stringent protection and with the aid of management plans for their habitats. The Kashmir stag is a close relation of the European red deer, and because of its dwindling numbers the World Wildlife Fund in association with the State Government of Kashmir has formulated a project for saving this animal in the Dachigam Sanctuary near Srinagar. Although the population of this deer was estimated at around 550 in Dachigam in 1957-1958, it is feared to-day that the number is nearer 200. This decline has been largely due to poaching, which has now been arrested. Some, like the Manipur brow-antlered deer *(Cervus eldi)* with only fourteen individuals left, seem almost beyond redemption. In this case protection has not been enough; it is the loss of the very specialized habitat which is the main factor in their decline. The Indian rhinoceros *(Rhinocerus unicornus)* appears to be doing well in the sanctuaries of Kaziranga (Assam) and Jaldapara (West Bengal). The World Wildlife Fund and other international bodies have played a sterling role in saving this animal by providing arms and walkie-talkies to the sanctuary staff to deal with poachers who were the biggest threat to this animal, because of the allegedly aphrodisiac qualities of its horn.

The carnivores, critically placed at the top of the food chain, suffer the most when wildlife populations decrease; so the tiger was seriously endangered until very recently. Being the magnificent animal that it is, its predicament caused worldwide concern, and it was clear that unless some extraordinary steps were taken the population of 2,000 as against the estimated 40,000 in the earlier years of the century would not be able to survive. The World Wildlife Fund and the International Union for Conservation of Nature and Natural Resources must take great credit for having stimulated the government of India to formulate Project Tiger, which got under way in April 1973. Nine tiger reserves comprising the best tiger habitats in the country have been established, and the annual reports of the project indicate that the population has increased. This project will cost approximately 6 million U.S. dollars during its five-year period, and it is rightly acclaimed as the largest conservation effort in the cause of any single species ever undertaken in any country. The added advantage is that large stretches of India's magnificent forests and several other species inhabiting these areas will also be rehabilitated in the course of this undertaking. Every attempt is also being made to involve international expertise in this enterprise. Recently Paul Leyhausen, Chairman of the Cat Group of the Survival Service Commission of the IUCN, was invited to visit the reserves and offer his comments. His report is now before the Steering Committee, and many of his suggestions are being implemented. A course in tranquilizing animals has also been given to selected forest officers and others, and the expertise acquired will be valuable in translocating animals from denuded areas to more promising habitats to ensure their survival.

One of the problems of Indian wildlife is that well-trained ecologists are not available for manning the sanctuaries. To remedy this shortcoming it is proposed to introduce university courses in wildlife management at the Ph.D. level. After these students emerge as qualified wildlife ecologists, our sanctuaries will hopefully be managed not by foresters whose principal interests are connected with silviculture, but by people who understand the significance of maintaining wilderness for wild animals. Then will India's wildlife truly come into its own.

Zafar Futehally is vice president of World Wildlife Fund–India, and a member of India's National Committee on Environmental Planning and Coordination. *This article is reprinted with permission from National Parks and Conservation Magazine, March 1977. Copyright 1977 by National Parks and Conservation Association.*

Nesting Lepidochelys olivacea (Hughes)

TURTLE EGG COLLECTION

by S. Bhaskar

S. Bhaskar, Field Officer at the Madras Snake Park Trust, has provided us with some notes and methods of turtle egg collection. Most of the procedures given below are from Madras Snake Park's past experience plus some points from the author.

Extremes of temperature and humidity are the main factors to be guarded against, besides mechanical damage to the eggs. In general, low temperatures (down to 20 C for short periods) are better tolerated than high temperatures (36 C and above), and high humidity better than low humidity; the latter will cause dessication of the eggs. Exposure of the eggs to the hot sun should be avoided.

Oxygen present in the air should be available to the eggs for their metabolism. The egg chamber dug by the turtle provides its own air requirements. Eggs may be transferred from nest site to hatchery in sealed plastic bags, but must not be stored within them for long periods.

Methods of collection

The eggs are collected at the time of laying (or soon afterwards) in polysthene or cloth bags, one clutch per bag; the eggs are counted in the process. The position of the nest site on the beach, the depth of the uppermost and of the deepest eggs, and the dampness of the nest sand are noted. Olive Ridley eggs on India's east coast and in Lakshadweep are usually situated between 9" (topmost eggs) and 15" (lowest eggs) below the sand level. Hawksbill eggs may be buried a little deeper, perhaps 13" to 19" and Green turtle eggs 22" to 30" below sand level. Allowance has to be made for the depth of the overlying dry layer of sand – the greater this depth, the deeper should the eggs be placed in the artificial nest.

If compelled by circumstances to collect eggs in the daytime, the best times are early morning and late evening (or anytime on overcast days).

The hatchery

The hatchery is located at a sandy site where the sand has a texture and dampness similar to that at the natural nest site, at the corresponding depth. The nests are spaced ½ to 1 meter apart.

The hatchery is built using chicken wire mesh ½ meter under the sand, 1½ meters above, supported by bamboo stakes. Our 1977 hatchery was about 3.5m x 5m and contained 130 nests, which we found was too crowded and created complications at hatching time.

To make the artificial nest, dry sand is first removed from the surface over an area of about 2 ft. in diameter, in order to prevent it from sliding into the nest as the nest is dug.

The egg chamber is made by scooping out the damp sand handful by handful; this sand is heaped within reach taking care not to mix it with dry sand. The egg chamber is shaped like the original nest. This is roughly amphora-shaped, having a neck diameter of about 7" and a basal diameter of 10" – 14". Having placed the eggs in the egg chamber at the appropriate depth, the neck is plugged with damp sand, allowing as little sand as possible to trickle between the eggs, and tamping gently as the damp sand is placed above the chamber. The nest site is finally leveled and labelled with a tag stating the number of eggs, the date of laying and the locality where laid.

If for some reason it is impossible to dig the artificial nest on the night the eggs are laid, it may be made in the early morning or late evening. The eggs are transferred in as short a time as possible with minimum exposure to the sun's heat.

Nest sand temperature for the Olive Ridley *(Lepidochelys olivacea)* at Madras is 30–31 C – 26–32 C is quoted for Green turtle *(Chelonia mydas)* nests. This range may be appropriate for other species also.

If possible, regular temperature checks are kept at the wild nesting sites (one or more control nests may be left there) and temperatures compared with those in the hatchery sand. Egg temperatures may spontaneously increase as incubation proceeds to a level of 1 to 5 C above that of the surrounding sand. This is allowable.

If egg laying occurs at the beginning of the hot, dry season (as it does on India's east coast), it may be necessary to make a partial shade cover of coconut leaves for nests incubating in the extreme heat (also useful at hatching time to deter crows, etc.).

It is most important to guard against dogs, ants and other predators (including birds) especially at hatching time. As each clutch of hatchings emerges, count and remove *all* the dead hatchlings, undeveloped and partially developed eggs and shell debris.

Release of the young at sea is probably more natural at night, preferably within a few hours of emergence of the hatchlings. Guard against beach crabs and the hot sun.

The author and the Madras Snake Park Trust would welcome any correspondence for information exchange or clarification of methods. They would be grateful to hear from others involved in similar turtle programmes so as to compare results. Write to: Madras Snake Park Trust, Guindy Deer Park, Madras – 600 022, India.

NOTE ON PUG MARK TRACING

by R.K. Bhatnagar

Most studies on mammals include studies of pug marks for various purposes such as population estimates, movements, age grouping – and identifications as shown by Nico J. van Strien in TIGERPAPER V:1, on Javan and Sumatran rhinoceros. Generally plaster casts are made, which is a fairly cumbersome process. Recently from India, two pug mark tracing devices have been developed by K.S. Sankhala and Saroj Raj Chaudhary.

Both use a basically similar principle which is to make pug mark tracings on a plastic sheet which is fixed on a frame with a winding device at both ends. These simple devices are easy to handle and can be conveniently used in any terrain. They also afford possibilities of making tracings of several pug marks at a time i.e. one after the other.

I feel that if the plastic tracing sheet is provided with a graph screen with markings of angles from centre, these would provide a better aid to differentiate pugs of different individuals. Of course techniques will have to be standardized through studies on known animals of known age groups (from zoos) before interpretation of field data can be done. It is also likely that with standardizations and by substantiating with data on the morphometrics of pug marks, this aspect can be placed on a proper scientific footing. Regarding morphometrics, I might add that practically nothing has been done in this field so far.

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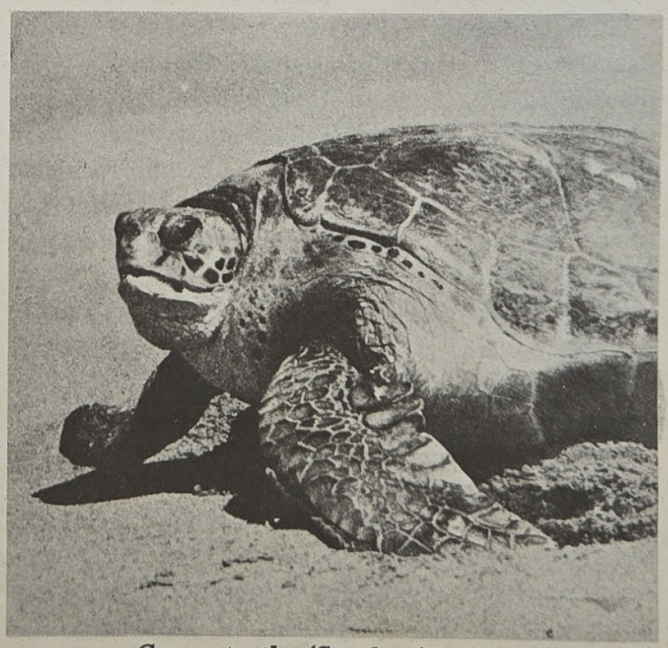

Green turtle (Steuben/Hughes)

A FIELDSTUDY ON SUMATRAN ORANG UTANS *(Pongo pygmaeus abelii* Lesson 1827)

Ecology, Behaviour and Conservation

by H.D. Rijksen 1978. H. Veenman & Zonen B.V. – Wageningen. The Netherlands.

This fieldstudy by H.D. Rijksen of the Nature Conservation Department, Agricultural University, Wageningen, The Netherlands, discusses the results of a three year research project on the Sumatran orang utan found in the Gunung Leuser Reserve, Indonesia. Below is the summary of the fieldstudy.

The results of a three year research project on the ecology, behaviour and conservation of the Sumatran orang utan are discussed. The 150 hectares Ketambe study area lie within the boundaries of the Gunung Leuser reserve in Aceh Tenggara, and consists of mixed rainforest typical of hilly regions.

The orang utan's food is irregularly distributed in quantity, space and time within this area. Although the orang utan is frugivorous he also eats leaves, insects, 'bark' and several other less important foods, such as bird's eggs. *By far the largest part of the 144 food plants collected is typical primary rainforest growth.* Figs make up an important part of the diet, particularly those known as the 'strangling' *Ficus* spp. As the fruiting seasons of the various strangling fig species are staggered over the whole year, and such trees are often enormous in size, they form particularly suitable food sources. Orang utans appear to have a good topographical knowledge of their 'home range'. There are indications that fig trees bearing ripe fruits are sometimes found by using the flight paths of flocks of hornbills, which also feed on figs. With respect to figs in particular, the orang utan must compete for its food with many other species, notably primates.

The study area was regularly used by 22 individually recognized orang utans. Both males and females live in homeranges which overlap considerably and are 2–10 square km in extent. The population density of the Ketambe area is considerably higher than that reported for other areas in Indonesia, being approximately 5 individuals per square kilometre. Orang utans live a 'limited gregarious' lifestyle, that is, adult males spend the largest part of their time alone, and avoid encounters with other adult males. The adult females and their offspring stay together for the first 4–5 years of life (the birth interval is at least 3 years) . Adolescent social groups form after the mother-offspring bound becomes weaker. This social phase continues for each individual until either (a) the sexual dimorphistic characteristics of males are clearly distinguishable (at approximately 15 years of age), or (b) the female's first young is born (approximately 10 years of age). Adults also have social moments in their lives. Several individuals in an area can come together to form a 'temporary association' in certain fruit trees. It may be seen from their behaviour that they know each other well and that a network of relationships exist which is partly based on competitive dominance. A peaceful co-existence between adult males however, has not been observed; meetings between adult males had invariably an agonistic character. The sexual behaviour of the orang utan is roughly divisible into: (a) 'raping' of some females by sub-adult males; and (b) co-operative matings, where females often take the initiative by presenting themselves to, usually, adult males. It appears that only the latter makes an essential contribution to reproduction.

The social behaviour of the orang utan is considered and described in detail. Comparison of the behavioural repertoire of this species with that of the (gregarious) chimpanzee shows that the two species are closely related. There are clear differences in social organisation, however, which appear to be mainly of degree, rather than of quality. The social organisation of an animal must be a factor that fits its situational (i.e. environmental) context, but is based on phylogenetic characteristics. Comparison of the habitats of these two apes reveals that they both live in a similar ecological condition with respect to food. The reasons for the exceptional life-style on the part of the orang utan are possibly to be found in the predation pressure the species is exposed to, particularly by man. Man has been present in regions of South-East Asia since the Pleistocene. It is plausible that the orang utan has been persecuted by man continuously from this time. A comparable influence on the chimpanzee is much more recent. The orang utan is the heaviest arboreal creature and has an exceptional social organisation for a primate. If it may be assumed that high intelligence, is a biological outcome of complex group life then, on grounds of intelligence, and from the distinct social organisation and current arboreal life-style it may be postulated that the orang utan has evolved from a ground-living social ape. This original form was supplanted from its niche by a better adapted ground-living social ape, that is, man. It is possible that a strictly arboreal life style for an animal as heavy as an adult ornag utan is not compatible with a social life-style. Moreover, it is likely that refraining from a high degree of sociability and inconspicuousness are the best strategies against human predation.

Since one possibility is that the hunting pressure in ancient (and current) times had a great influence on the biology of the orang utan, I have paid particular attention to hunting behaviour in hominids. At present, this form of threat is overshadowed by

excessive habitat destruction. Cultivation in connection with the explosive population growth in Indonesia, together with the commercial timber concerns, affect the tropical rainforest ecosystem in such proportions that even reserves are threatened. Despite being protected since 1932, the orang utan is a severely endangered species. Rehabilitation of orang utans is a conservation action directed at reducing the still ongoing hunting pressure. This is despite the fact that there are clear risks in this to the wild population. These risks can be negated by confining rehabilitation projects to areas lacking a wild orang utan population.

The orang utan is a component of an intact ecosystem and it is of utmost importance that the emphasis of nature conservation schemes is placed on the totality and balance of the tropical rainforest ecosystem. Every form of commercial exploitation within this ecosystem is incompatible with the proposed goal of preserving the system. The removal of components (e.g. 'selective logging' or 'selective hunting') does real damage to the balance of the system.

An orang utan who lives in an exploited forest is in principle of equally small biological value as an orang utan in a zoo; it is a, debatably essential, biological solution that does not correspond to the set of conditions originally operating in its natural selection.

Wild orang utan (Rijksen)

THE ECOLOGY AND BEHAVIOUR OF THE GREATER ONE–HORNED RHINOCEROS

Andrew Laurie has written his Ph. D. thesis on "The Ecology and Behaviour of the Greater One–Horned Rhinoceros (Rhinoceros unicornis). It is the culmination of three years field work principally in the Chitawan Valley, Nepal and the Brahmaputra Valley, Assam, India.

This is the first detailed field study to be made on this species. Below is a summary of the thesis.

A field study of the greater one-horned rhinoceros was carried out in the Royal Chitawan National Park, Nepal. The study spanned 3 ½ years, during which comparative observations were made in the Kaziranga National Park, Assam and other localities in Assam and West Bengal.

The past and present distribution of the rhinos are discussed and the study areas are described with reference to their climate, vegetation, fauna and history of human occupation and influence. The decline in numbers of rhinos has been mainly due to destruction of their riverine grassland habitat and poaching for the horn.

Observations in the tall grasslands of Chitawan were made on foot, from elephant back or from tree platforms. The size, sex and age structure of the Chitawan rhino population were determined by individually identifying over 200 rhinos in two main study areas. Differences in horn shapes and nicks in ears were among the features used for individual recognition. There were differences between the two study areas in population density, which were related to habitat differences. The overall adult sex ratio was 62 males to 100 females and there were fewest males in the areas of high population density. Sex ratio at birth was near parity but mortality of male calves was high and 17% of all recorded deaths were the result of fighting among males. Intercalving intervals averaged 3 ½ years and the population was increasing at a rate of about 2% per year.

Rhinos fed mainly on tall grasses such as *Saccharum spontaneum* and short grasses such as *Cynodon dactylon*. They also browsed on a wide variety of shrubs and trees and fed extensively on aquatic plants and agricultural crops. A time sampling method was used to determine food preferences in different habitats and seasons. Transects were walked to determine food availability and it was shown that the main variation in diet was the result of seasonal variations in availability of food types and consequent movement of rhinos between habitat types. Seasonal movements of identified individuals were shown to be

related to food availability.

Adult males were mainly solitary. Adult females were normally accompanied by a single offspring and occasionally by an adolescent. Adolescents were either solitary or in temporary groups of up to nine.

Breeding males occupied mutually exclusive home ranges or, in areas of highest population density, shared a common home range with one or more other breeding males. Various visual and olfactory displays were used by breeding males to advertise their presence. Fights took place between resident and intruding breeding males but adult males which did not display, were tolerated. Adolescent males were more often attacked by adult males when alone than when in groups; they tended to adopt the home range of the resident breeding male. Adult females occupied overlapping home ranges larger than those of adult males and were more often accompanied by adolescent females than adolescent males. There was more aggression between adult males in the areas of higher population density and this corresponded to a longer average intercalving interval.

Interspecific relationships are described and the rhino's part in the ecological system of Chitawan discussed. The results of the study in Chitawan are compared with the results of shorter study periods in Kaziranga. The evolutionary and adaptive significance of the findings are discussed and the greater one-horned rhinoceros is compared with the other four species of rhinoceros.

The implications for conservation are discussed. The main threats to the rhinos' survival are habitat loss due to flooding and erosion, agricultural encroachment and the spread of certain exotic plants. Poaching is well controlled at present. As 85% of the 1,100 rhinos which remain are restricted to 500 km^2 of suitable habitat in two National Parks there is a danger of overcrowding, facilitation of disease transfer and possible increase in intraspecific fighting. The possibility of reintroductions of rhinos to other areas is discussed.

Mr. Laurie's address is: Dept. of Applied Biology, University of Cambridge Pembroke Street, Cambridge CB2 3DX, U.K. There is available a filmstrip/slide set entitled "The Greater One-Horned Rhinoceros", jointly prepared by Andrew Laurie and the World Wildlife Fund. Prices for the Rhino filmstrip (including illustrated script) are US $ 7.50 (including cost of airmail postage and packing) and US $ 15.00 for the mounted slide set in plastic wallet. A pre-recorded commentary (on standard international compact cassette) ordered at the same time costs US $ 6.00.

FORESTS FOR PEOPLE. . . . .ONCE?

by M. Jacobs

A biologist looks at the long-term aspects of deforestation in Indonesia, trying to fathom the arguments beyond it. The 8th World Forestry Congress offers an opportunity for a variety of people to think about the basic issues of exploitation.

Magnitude of the problem

A big array of fact is revealed in a 95-page **Report on the Forestry Situation in Indonesia** (May 1977) by Dr. C. Chandrasekharan. 118.37 million people lived on a land area of about 2 million square kilometres in 1971. By 1976 they had multiplied to 134.70 million. About 1,200,000 sq. km comes under the Forestry Service; 850,000 sq. km is said to be closed forest. Man-made forests occupy 1.8%, i.e. 20,000 sq. km. Forests damaged and/or cleared for shifting cultivation amount to 200,000 to 370,000 sq. km, bare lands amount to 126,000 sq. km. Every year, another 2000 sq. km is lost to alang alang.

Rated operable for logging is 500,000 sq. km, or perhaps 650,000; so far, 350,000 sq. km has been given out. In Kalimantan (where already some 100,000 sq. km is under secondary growth), concessions amount to 202,000 sq. km, in Sumatra (where 110,000 sq. km has been affected), they amount to 90,022 sq. km.

Concessions are given out for 20 years, much shorter than the 35 years of the envisaged 'Indonesian cutting cycle', which is itself far shorter than many Dipterocarps need even to come into flower. The loggers extract as much as they can: "A tendency to make quick returns on minimum investment and fast withdrawal possibility is pre-eminent" (P. 45). 'Forestry agreements' are also issued; these enable the holder to carry out restricted logging operations during six months' time.

The target for conservation areas is 100,000 sq. km. Good progress has been made to realize this, but fulfillment is still far away. Little of the protected area is under primary lowland forest, most being situated at higher altitudes, and under less valuable vegetation. Acquisition of primary lowland forest for conservation meets with difficulties; moreover, those parts of reserves that are under fine forest are lost to loggers, as has happened in East Kutai and Sekundur. How is it possible that people can do such a thing to their own environment?

A first answer

"One of the outstanding problems in developing

Logging road, Sekundur Reserve, Sumatra (Jacobs)

countries is poverty, which manifested in shortage of food, of poor health care, clothing and housing for the people.

Ways and means to solve these problems are a.o. creating jobs and employments and creating good climate and opportunities, necessary for development of sound enterpreneurship for the people. This can be done by wise use of natural resources on the basis of sustained and maximum use principle, especially the so–called renewable natural resources.

Neglecting the prevailing poverty of the people ever becoming worse means neglecting the ever worsening of the human environment. The main threat to the human environment in this region is poverty of the people. As we have in Indonesia, the main dangerous threat for the conservation of the forests are the poor shifting cultivators, who have given birth to millions of hectares of waste land. Neglecting these people in illiteracy, malnutritioned and indigent will result in ever increasing danger of the total forest destruction and ever increasing of the unproductive waste lands.

Mechanical logging in Indonesia has been introduced as one of the primary forms of human efforts in utilizing the renewable natural resource, the forest, in creating jobs and employment and developing enterpreneurship for the Indonesian people and at the same time to increase the Government's revenue."

These are the opening words of a paper by Mr. Prijono Hardjosentono, director of the Conservation Service (PPA), presented at the Symposium on the Long–term Effects of Logging in Southeast Asia, held at Bogor in June 1975.

It is evident that the question of renewability of the rain forests is a pivotal one. If it cannot be proven that the rain forest is indeed a renewable natural resource, the whole matter assumes a different perspective.

An unwelcome message

Of course, it would be fortunate if the tropical rain forest could be counted among the renewable resources. If this were so, biologists all over the world would not need be concerned. But they are concerned, and I think rightly so. They have read the paper by F. Kramer (*Tectona* 26: 155 –185. 1933), where it is observed that only a gap in the canopy of 100 square metres or smaller will close quickly. P.F. Burgess (*Mal. Nat. J.* 24: 231–237. 1971) noted that extraction of a mere 10% of the trees results in a loss of 55% of the canopy, so a mere 35% is to remain. The trenchant, knowledgeable booklet by W. Meijer, **Indonesian Forests and Land Use Planning** (Lexington, 1975) gives further data and photographs to show the

ravages left by the loggers, and gives sombre expectations with regard to the future of the primary forests. My personal impressions in the field and from reports old and recent all point to the conclusion that the tropical rain forests are very fragile, and irreplaceable. They suffer from the lightest touch. Repair of damage takes ages.

The facts of ecology usually take a long time to emerge, but when they have done so, they can be very unpleasant, and are often beyond remedy. The biologist who diagnoses them has a thankless task, for other reasons as well. It is his duty to speak up on behalf of those plants and animals which are defenseless against man, and his words interfere with the rights of man to exploit nature as he desires. The biologist sees disasters in the making for the children and grandchildren of a nation which disregards the laws of ecology.

Worse, the biologist must refute arguments that run against the laws of ecology. If the authorities defend the sell–out of the Indonesian forests by saying that the revenues would alleviate poverty and create opportunities, he must answer: *To the forest it makes no difference for whose sake it is cut down. Whether a terrain is logged for the rich or for the poor,* erosion will set in, the run–off will be disturbed, the climate will be hotter, colder and drier, the animals will flee and perish, and whatever potential the land held for the future will vanish along with the minor products that so far it might have yielded.

And I think that a scientist must speak up. Who else would? But I ask you: would it be right if we withheld part of the truth as we see it on the basis of our information and impartial judgement according to the standards of our discipline?

Causes of the forest destruction

Of such a ubiquitous evil as deforestation, that seems impossible to stop, the cause must be complex and manifold. There is unorganized destruction by shifting cultivators; in Indonesia, their number is estimated at eleven million. They operate in line with a long tradition of balanced, moderate exploitation. Overpopulation taxed the land too heavily, which led to a disruption of the system and the sacrifice of forest far *more* than *previously*. Shifting cultivators often complete the forest destruction started by the loggers. From an ancient, rather harmless practice, shifting cultivation has become an environmental disaster. But a moderate one if compared with the destruction carried out under license.

Large–scale clearing with official permission was formerly done to create room for plantations. It is still being done for transmigration projects, in a sometimes very wasteful manner, as W. Meijer has described for southern Sumatra. Since 1967 it is going on through modern mechanical logging. For this purpose, concessions fill the maps of Sumatra and Kalimantan to saturation, while western New Guinea is in the process of being carved up.

It seems (to me) unlikely, that this planned devastation of the forests would be accepted at all by the population - - unless they tacitly welcome deforestation for some reason or another. How else can such a threat to the environment be allowed to materialize? In the present paper, we are in search for these reasons. They may be deepseated in men, and they apparently carry much weight. Let me endeavour to list a few. Only after identification can they be discussed and perhaps controlled, difficult though this may be.

Sheer greed for quick profit, with indifference to others including the next generations, may play a part, but is not very specific as an argument. So here are others:

1. A long–standing traditional hate against any vegetation taller than man.
2. A desire for power over nature.
3. Ignorance of the laws of ecology, or even aversion towards them.
4. The rights of man, who regards himself as supreme on earth, without concern for the rest of the creation. The right to propagate.
5. The rights of nations, to be autonomous and free in the choice and decisions about their own future.
6. An imperative to produce more and to consume more, so that a 'better life' results.
7. Development of advanced machinery to realize all this.

Illusions about the rain forest

None of the above points lends itself very well for an animated, open discussion. For this reason, there is no way of proving me right. But there may be indications. For instance, it must be very painful to talk about 'progress', a concept which in this part of the world appeared so fresh and looked so immensely hopeful. No sooner had it reached the Third World countries, than it seemed to have lost its vigour. In the most advanced western countries, 'progress' came under criticism, and was abandoned by many. Promises made in its name often remain unfulfilled. Faith in technology and in doing things on a large scale is waning, faith in 'ecology' and doing things on a small scale is growing . . . . in the West. This must have shocked many people. Few things are harder to deal with than misdirected hope.

It then seems natural that illusions linger about

the tropical rain forest

How tempting it would be to reckon it among the renewable natural resources, with its immense stature and inexhaustible diversity. How tempting to believe that rich soils must lie under its huge biomass! How necessary to assume that there is plenty of tropical rain forest in the world: this last frontier will not give out! How pre–emptory to suppose that it will quickly regenerate after depletion, to greater profusion if the silviculturists do their best. Animals like orang utan, so we are told in earnest, are actually better off in secondary than in primary forest.

The alang alang satifaction

Thus ecological ignorance merges into ecological hypocrisy. The result is that forests are cleared for the slightest pretext. Isn't it splendid that through logging we fulfill the long desire to subjugate nature, and in doing so with the most sophisticated equipment we firmly stand in the technological era? In asserting our power over the land we establish our rights as citizens of a nation, and contribute to democracy by creating opportunities for the poor.

And finally, there will be rest. All this conflict over the forests, all the uncertainties, they will vanish with the forest. Then we'll be relieved from the admonitions as well. In the end, no more confusion; poverty allright, but peace. The forest with all its complications will never bother us again. Let it go. If there are too many people (it is obvious there are), why not let them die? The human race is like alang alang: burned over, it will grow again, and stick its white spikes in the dry wind, in uniformity, as another legacy of the democratic syndrome.

I am trying to understand what is going on. How else could one explain the logging in the Sekundur Reserve in northern Sumatra? The highest authorities recently permitted the logging of 10,000 hectares of the finest lowland forest as a "pilot project". Half a year before the contract was signed, permission was already granted to start on 1000 hectares. To justify the logging, a number of bewildering reasons have been set forth, arguing, for instance, that the logging would be necessary to prevent more logging, and that roads were needed for better patrolling the 'improved habitat'. More details and comments are given in *Flora Malesiana Bulletin* (31) 3029–3034 (1978).

Tropical forestry: limits and possibilities

But what if the tropical forests are expertly and carefully managed, with ideal intensity? Well, even in the realm of forestry, I note a growing awareness that the limits of what can be achieved are rather severe, witness the paper by J.E.D. Fox, Constraints on the natural regeneration of tropical moist forest (*For. Ecol. Managem.* 1: 37–65. 1976). To the biologist, this is no surprise, in view of a general poverty and fragility of the soil in connection with the everwet hot climate, and the complexity of the forest eco-

Protect game
Spare game
'Game Reserve'
Langkat Sekundur

It is illegal – *to enter without permit*
– *to carry firearms*
– *to hunt*

P.P.A. Sumut (Jacobs)

system. Moreover, the biologist is aware that all tropical forestry aims at reduction of the number of species in these ecosystems, which must result in impoverishment of forestry potential, slowly but inevitably. Therefore, it a forest is to function it needs all the species in it, and all of these are interrelated through pollination, dispersal, or recycling. Efforts to take out or to suppress certain species will have their repercussions on others. Once a population of individuals of plants or animals has been reduced below a critical number (calculated for plants at 1000 to 25,000, depending on the species), the population is lost for evolution. Below the minimum number, it can perhaps maintain itself, but no more extend itself, for lack of innate diversity to respond to changing conditions and opportunities. Extinction is then a matter of time. For this reason, whatever remains of the untouched forest should be left intact, kept absolutely inviolate from steel and fire. Tapping of this primary source of materials for forestry could be done, but only after sufficient research and with great caution. These materials are the slow–growing hardwood species, which need shade for their germination and often for their adolescent life, those which at present are being so rapidly depleted.

The second source of materials for tropical forestry is the secondary vegetation. It supplies the softwood species, which grow fast, and need light during all stages of their short life. Among them are *Anthocephalus, Eucalyptus, Macaranga,* and *Pinus.* This source is much poorer in potential than the primary forest, but its species are widespread, well–known (in contrast to those of the primary forest which often are very local and still poorly known), and constitute a natural resource that is perfectly renewable. It is very suitable for exploitation; foresters have already carried out valuable experiments with many of its tree species These species are suitable for plantations. Such plantations, being purely artificial, lack the complexity of the primary forest, as well as the difficult element of long–term planning and long–term care. Could this be among the reasons why some times primary forest is cleared for woodplantations?

I don't see the primary forests as the theatre for tropical forestry; biologically this would be irresponsible. Rather it is the large regions where the forests have already been damaged. The intact nuclei of primary forest are surrounded by a mosaic of vegetation types that all have been derived from the primary forest climax, with alang alang steppe as the ultimate stage of destruction. While it will be impossible to restore depleted rain forest to its former potential, there may often be a structure left where silviculture could step in to utilize the materials brought in from the primary forest source. Materials from the secondary forest sources are suitable for the rehabilitation of alang alang and other less degraded land, and for the supply of firewood. Such, in outline seems to be the only forest policy which is compatible with biological facts and views.

Food for thought

Of course, forestry must be in step with economy. But economy is obviously not always the decisive factor. Compare the low revenue of logs from one hectare with the high cost and risk to reforest one hectare; compare the huge tracts of wasteland with the potential it once carried - - is this economy? Besides, what is economy? Predictions, plans, priorities, all change radically with the scope of time. What seems attractive, meaningful, urgent for next year, pales in the face of the next century. On the other hand, long–term thinking lends a weight to prospects which today may seem insignificant. So it may be 'practical' and 'sensible' to let economy have the last word, but this would be deceptive if it is spoken in order to cut short a different point of view, over a longer span of time.

Thus the 8th World Forestry Congress offers food for thought. It is held on an island which was known as a paradise and which now, because of overpopulation and overexploitation of the forests which once covered it as a protective blanket, faces a very bleak future. Of course, there are many technical issues to be discussed by the participants. But the basic issues are for others to think about as well, people of all descriptions.

I hope that many people will examine my seven hypothetical causes of forest destruction, and my speculative reasoning about the alang alang satisfaction, to discuss their validity. What do we want to become of our tropical rain forests? If hate, indifference, and greed are allowed to prevail, no conservation effort will save them.

There is certainly a growing interest in what a rain forest actually is, and with an increased understanding of these forests there is still hope that they will survive in the future.

SYMPOSIUM ON WILDLIFE POPULATION DYNAMICS

BIOTROP recently held a Symposium on Wildlife Population Dynamics on March 15–17, 1978 in Bogor, Indonesia. Below is a summary of the recommendations generated by the Symposium.

INTRODUCTION :

The Symposium on Animal Populations: Wildlife Management in Southeast Asia recognized that habitat destruction due to human activities is threatening a wide range of species of plants and animals with extinction. Habitat destruction is not an easy problem to solve, being closely involved with economic development, the spread of fossil fuel-fed technology, and the increase in human populations. But it is a problem which must be solved if mankind is to prosper, and the following recommendations, if implemented, will start governments and the public on the trail leading to an improved environment for both man and wildlife.

RECOMMENDATIONS :

1. Governments of the SEAMEO member countries should provide conservation and resource management departments with sufficient manpower, training, financing, and institutional support to faithfully implement existing or improved conservation laws. Such upgraded departments should be given increased responsibilities for ensuring the ecological soundness of government development plans, and for recommending and implementing ways and means of minimizing adverse ecological effects of socio–economic development.
2. The major conservation aim should be to conserve large representative samples of all major ecosystems in each country.
3. Each country should seek improved means of control over the utilization of all natural resources, including through local, national, and international legislation.
   Particularly important for wildlife is the ratification by all countries of the Convention on International Trade in Endangered Species of Wild Fauna and Flora.
4. A great expansion of research on wildlife management topics is urgently required in order to provide data to effectively manage wildlife resources (both plants and animals). Until more research is completed and wildlife managers can predict the effects of their management activities, there should be a moratorium on all habitat management projects. For the present, management should mean protection.
5. There should be improved coordination among conservationists of the SEAMEO member countries, at both the governmental and non-governmental levels. This can be accomplished through international reserves along borders or in the sea, and through increased exchange of information, including periodical publications, audio-visual materials, and technical data. A set of standardized criteria should be established for gathering data pertaining to wildlife from each country; such information should be compatible with computer retrieval systems.
6. Conservation education for the public should be greatly increased in order to provide widespread support for conservation efforts. Emphasis should be on television and wider distribution of magazines such as Nature Malaysiana, Conservation News of Southeast Asia, Malayan Nature Journal and other publications on wildlife conservation and management which may be published in the other Southeast Asian countries.
7. BIOTROP, as the SEAMEO Regional Center for Tropical Biology, should realize its important role for stimulating conservation action in the region, particularly through control of the use of chemical agents in agriculture, inclusion of ecological impact statements in the planning of development activities, and improved control of timber concessions. In cooperation with other international organizations, BIOTROP should be encouraged to hold more conservation-oriented symposia in the future, since in conservation is the hope for the future of mankind.

IUCN/SSC ASIAN ELEPHANT GROUP

NEWS NO 5

1. GENERAL

On May 16th 1978 at the Selfridge Hotel, London, the prestigious Swiss watch company, Montres Rolex of Geneva, presented "Honourable Mention" Awards to five British applicants in their "Awards for Enterprise" scheme of 1976-1977.

Amongst those honoured with a Rolex chronometer and commemorative scroll was Robert Olivier, Co-Chairman of the IUCN/SSC Asian Elephant specialist Group, for his entry entitled "The planning and development of a new type of wildlife preserve for use in Asia, tentatively called *Elephant Ranges".*

It is encouraging that the Elephant Range concept, which has become central to our plans for the long-term conservation of the Asian elephant (as outlined in our first News; **Tigerpaper** 4(4): 22-25), should receive such significant recognition. However, the honouring of an idea or concept is still a long way from actually testing or putting it into practice in the field to perform the job it was designed for, that of securing the future of elephants and other threatened wildlife, Let us hope that backing for the practical application of Mr Olivier's ideas will not be far behind the backing shown for the ideas themselves. (See also Lekagul and McNeely, "Elephants in Thailand" in **Tigerpaper** 4 (3) 22-25.)

Robert Olivier (left) receives his Award from Tom Sheppard, the Saharan explorer. Iain Nelson, Managing Director of the Rolex Watch Co. (London) looks on from behind. (Photo: Durden–Smith/Rolex)

2. BURMA

Since our last News the following information has been received. The English language **Working Peoples Daily** reported on 5th July 1978 that in addition to using modern timber extraction methods, the Ministry of Agriculture and Forests has taken steps to catch more elephants for use in extracting timber. Typical annual catches in recent years have been about 100 animals, but the Government now wishes to capture 600 more per year in order to meet with an

A working elephant, carrying a piece of firewood in its mouth climbs the bank of the Rapti in Nepal's Royal Chitawan National Park. Wild elephants are no longer found in the Park, where they abounded in the 18th and 19th centuries. (Photo: Laurie)

export target of 340,000 tonnes of teak in 1978 – 10,000 tonnes more than last year.

The Ministry has now raised the price for catching elephants, and offers K7,000 (U.S. $ 1.00=K 6.8) for an elephant with a height of between four feet six inches and five feet five inches. If an elephant caught is more than five feet six inches high, K 2,400 is paid for every extra foot.

As a result of this incentive more than 60 elephant catching teams of the Timber corporation toured forests in the northern part of Burma and were able to catch 89 wild elephants (valued at K 2.5 million) during the last elephant catching season – October 1977 to April 1978.

These elephant catching teams captured 43 wild elephants by the *Khedda* or stockade method, 31 by *Melashikar* or lassoing, and 15 by using drugimmobiliser guns. The elephants captured were 31 from Myitkyina forest area, 28 from Mongmit forest area, 6 from Bhamo, 3 from Mawlaik, 1 from Shwebo, 2 from Toungoo, and 18 from Sandoway area.

During pre-war days various commercial enterprises employed about 5,000 elephants in timber extraction work. Due to deaths and losses however, only about 2,000 timber elephants remained after the Second World War. According to the newspaper article, the Timber Corporation now has 2,673 elephants including the elephants caught recently.

We have heard that according to a 1969-70 Forest Department Elephant Control Scheme, the population of wild elephants was estimated at 7,000 for the whole of Burma. More recently, in a 4th May 1978 letter, M.K. Ranjitsinh mentions learning of another Forest Department estimate of 6,500 wild elephants. It is impossible to comment on estimates such as these until the methods they were based on be come known. As Ranjitsinh points out, in order to increase the exploitation of the country's most commercially valuable tree species, the most valuable animal species from the economic view point will also be exploited more (as evidenced by the drive to capture more elephants), and he asks "Will not both be over-exploited?"

In our last News we expressed the opinion that the wild elephant population was still under significant pressure from ivory hunters, and that the amount of ivory that falls into the hands of the authorities can only represent the "tip of the iceberg". That the 'tip' now appears to be large enough to warrant the sale by international tender of ivory belonging to the

Forest Department, can only add to our concern. According to June 1978 Burmese press reports two firms, International Jade Trading Co. and Seno Trading Co., between them paid over 64, 306 German marks for over 500 kilos of ivory.

3. CHINA

Without detailing the source, M.K. Ranjitsinh in his 4th May 1978 letter reports hearing that according to a 1973 census, 15 elephants were recorded as surviving in Yunnan Province, China.

Although this new estimate indicates a decline from the 100 or so elephants estimated for the area by the Yunnan Tropical Biological Resources team of the Chinese Academy of Science in 1958, the fact that any have survived at all suggests that the adequate elephant protection measures called for after the 1958 survey *may* have been implemented.

4. SRI LANKA

New Member

Dr S. Atapattu,
Deputy Director,
Department of Wildlife Conservation
54, Chatham Street,
Colombo 1,
Sri Lanka.

5. U.S.A.

On June 16th 1978 there was an informal meeting of the Elephant Interest Group (E I G), held during the 58th Annual Meeting of the American Society of Mammalogists (A S M) in Athens, Georgia, U.S.A.

The Board of Directors of the ASM has decided to schedule an Elephant Symposium entitled *The Natural History of Elephants* for the 59th Annual ASM Meeting in Cornvallis, Oregon, June 17–21, 1979.

Those interested may obtain further details from Dr. H. Shoshani, Dept of Biology, Wayne State University, Detroit, Michigan 48202, U.S.A.

WORLD WILDLIFE FUND FOR AUSTRALIA

The World Wildlife Fund will shortly establish a national organisation in Australia with the full support and encouragement of the Government.

The Prime Minister, Mr. Malcolm Fraser, recently received the World Wildlife Fund's Director General, Mr. Charles de Haes, and Mr. David Ogilvy, an International Trustee and member of the Executive Council, to discuss the proposed organisation.

Afterwards Mr. Fraser declared: "I am delighted that the World Wildlife Fund has responded so positively to the suggestion that it should establish a branch in Australia. There is wide recognition of the need for the WWF to begin operating here because Australia has some of the world's most remarkable animals and plants, many of which are endangered or confined to limited areas because of changes in land use.

"It is now accepted that an essential ingredient in national and international action to save these species from becoming extinct is money - for research, for management, and for the purchase of essential habitats. The World Wildlife Fund has a proven record as an internationally successful fund-raising organisation for conservation action, which relies on sound business principles in its operations.

Mr. Fraser said he understood that a large proportion of the funds raised in Australia would be spent on projects in Australia, especially in the early years.

Mr. Fraser announced that contributions to the World Wildlife Fund's Australian organisation would be made tax deductible, and he stressed that there was an important role for Australian business in practical action to achieve wildlife conservation through support for the World Wildlife Fund.

The World Wildlife Fund was established in 1961 to raise money to support nature conservation throughout the world. The Headquarters are in Switzerland and it has organisations in 26 countries. - Austria, Belgium, Canada, Denmark, Finland, France, Germany, India, Italy, Japan, Kenya, Luxembourg, Malaysia, Netherlands, New Zealand, Norway, Pakistan, Peru, South Africa, Spain, Sweden, Switzerland, Turkey, United Kingdom, U.S.A., and Venezuela.

By the end of 1977 it had disbursed over $ 30,000,000 for over 1800 projects in 131 countries, involving assistance to 260 National Parks and conservation of a wide range of endangered mammals, birds, reptiles, fish and plants.

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